

NATURAL RESOURCES CONSERVATION SERVICE CONSERVATION PRACTICE STANDARD

Spring Development (No.) No. 574

Definition

Improving springs and seeps by excavating, cleaning, capping, or providing collection and storage facilities.

Purpose

To improve the distribution of water or to increase the quantity of water for livestock or wildlife. Also to obtain water for irrigation if available in a suitable quantity and quality.

Conditions Where Practice Applies

Developments shall be confined to springs or seepage areas that can furnish a dependable supply of suitable water during the planned period or periods of use.

The need for and feasibility of protection from flooding, sedimentation, and contamination shall be considered in determining the suitability of a site for development.

Federal, State, and Local Laws¹

Design and construction activities shall comply with all federal, state, and local laws, rules, and regulations governing pollution abatement, health, and safety. The owner or operator shall be responsible for securing all required permits or approvals and for performing in accordance with such laws and regulations. NRCS employees are not to assume responsibility for procuring these permits, rights, or approvals, or for enforcing laws and regulations. NRCS may provide the landowner or operator with technical information needed to obtain the required

rights or approvals to construct, operate, and maintain the practice.

Permits may be required from the following agencies:

- 1. West Virginia Department of Health***
- 2. West Virginia Department of Agriculture***

Planning Considerations

Water Quantity

Potential changes in surface water quantity, especially base flow. Factor is the removal of obstructions and vegetation in the spring area.

Water Quality

Potential temporary degradation of water quality caused by erosion and sedimentation from the area disturbed during construction.

Design Criteria

A plan shall be prepared for all types of springs prior to installation, showing location of spring, collection system, spring box and necessary elevations.

Fracture and tubular springs. If water issues from rock fractures, the individual openings shall be cleaned and enlarged, as needed, to provide an increase in flow. The water from these individual openings shall be collected and conveyed to a central sump or spring box by means of tile or perforated pipeline or by a gravel-filled ditch. The collection works shall be

constructed an adequate distance below the elevation of the openings to permit free discharge.

If water issues from a single opening, such as a solution channel in a soluble rock formation or a tunnel in lava, the opening shall be cleaned or enlarged, as needed. A collection system usually is not required, but a spring box or a sump shall be installed at an elevation sufficiently low that water will not pond over the spring opening to a depth that will materially reduce the yield.

Perched or contact springs. Perched or contact springs occur where an impermeable layer outcrops beneath a water-bearing permeable layer. These springs shall be developed by intercepting and collecting the flow from the water-bearing formation. Collection trenches shall be used for developing these types of springs.

Artesian springs. Artesian springs shall be developed by removing obstructions, cleaning or enlarging joints or fractures, or by lowering the outlet elevation. Sumps and spring boxes shall be located so as to hold ponding over the spring outlet to a minimum.

Collection systems. If a collecting trench along the outcrop of the water-bearing formation is to be used, the trench shall be excavated so that it extends into the impervious layer.

An impervious cutoff wall of well-tamped clay, masonry, concrete, or other suitable materials shall be constructed along the downstream side of the trench if needed to insure that the flow enters the collection system.

The collection system shall consist of subsurface drainage tubing or perforated pipe not less than 3 in. in diameter, or of a wood box drain enclosed in a sand-gravel filter. A crushed rock or gravel backfill, not less than 12 in. deep, may be used instead of these types of drains.

When a spring box is not used in combination with the collection system, the pipe shall be extended to the trough, reservoir or distribution system.

Spring boxes. Spring boxes, if needed, shall be of durable material and shall have a tight, removable cover. The boxes shall have a

minimum cross-sectional area of 1.5 square feet. The floor of the spring box shall be not less than 6 in. below the outlet of the collection system. Spring boxes for perched springs shall be floored with concrete unless the underlying material is solid rock or other stable impervious material.

Spring boxes may be made of steel, concrete, masonry, or vitrified clay, and ribbed or corrugated PVC or P.E. Also, spring boxes made from any of the acceptable types of pipe listed in WV Engineering Standard 606 can be used. Polyethylene spring boxes will be protected from direct exposure to sunlight.

Spring box systems that can be contaminated by livestock shall be fenced, or the collection and conveyance system shall be covered with a permanent impervious membrane. The impervious membrane will be 4 mil. plastic minimum. Soil cover over the membrane shall be at least 12 inches. A 3-inch thick cap of concrete may be used in lieu of plastic and soil. When a plastic membrane is used in a system that is fenced, soil cover may be reduced to 3 inches.

Surface runoff will be diverted from the spring box to prevent entry into the water system. The top of the spring box should extend above the adjacent ground elevation to reduce the potential for surface runoff contamination.

The spring box may be located either upstream or downstream of the cutoff wall.

Outlets. The outlet pipe from a spring box shall be placed not less than 6 in. above the floor of the box to provide a sediment trap. However, the outlet must not be so high as to cause a head on the spring that can reduce flow. The outlet pipe shall be installed so as to insure a watertight connection with the spring box. Measures required to protect the development from damage by freezing, flooding, sedimentation, contamination, and livestock shall be included in the design.

The outlet pipe(s) from a spring box and/or through the cutoff wall shall be made of steel, copper, ASTM D1785 schedule 40 or 80 or ASTM D2241 SDR26 PVC pipe.

The outlet pipe from a spring box shall have a minimum inside diameter of 1-1/4 inches. Pipes through cutoff walls shall be installed with a watertight connection. Water from the spring box shall be conveyed to a tank or trough, or storage facility, which meets the applicable engineering standards. The outlet pipe inlet will be perforated or equipped with a screen to prevent clogging.

All areas disturbed by installation of the development will be vegetated according to the requirements of Standard 342, Critical Area Planting.

Plans and Specifications

Plans and specifications for installing spring developments shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

Operation and Maintenance

An operation and maintenance plan for spring developments shall be developed. The Maintenance Tips Brochure for Spring Developments can be used in most cases, but will be supplemented if necessary. Other items to consider are:

- 1. Annual inspection of the spring box for sediment build-up, clogging, or degradation of materials.***
- 2. Indications at the ground surface or outflow that there may be a hidden defect.***
- 3. Repair or replacement of non-functional or damaged components.***

¹Bold italics is information added to the National standard by West Virginia.

NATURAL RESOURCES CONSERVATION SERVICE CONSERVATION PRACTICE GENERAL SPECIFICATIONS

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All loose rock, sediment, logs, and vegetation that obstruct the free discharge of the spring shall be removed and disposed of so that they will not endanger the spring development.

Collection trenches, drain tiles, perforated pipelines, sumps, and spring boxes shall be constructed to the elevations and grades shown on the plans.

Crushed rock or gravel for collection systems and sand-gravel material for filters shall be composed of clean, hard particles.

Concrete used in construction of cutoff walls, spring box bases, covers and caps shall be ready-mixed concrete (3000 psi - 6 bags/c.y. mix.), pre-bagged commercially available concrete mix, or hand-mixed on-site. Cement will be Type I or Type IA meeting requirements of ASTM C150 and aggregates will meet the requirements of ASTM C33. Coarse aggregate will be Size No. 57 or No. 67 for ready-mix and hand-mixed concrete. Hand-mixed concrete shall be mixed at a ratio of 1 part cement, 2 parts sand, and 3 parts coarse aggregate. Pre-bagged concrete mix will be mixed according to the manufacturers' recommendation. Mixing water will be clean and free of substances that would effect the strength or durability of the concrete. Concrete will be mixed to a consistency that will allow proper consolidation in the forms, but not so wet that aggregates will separate from the mortar (approximately 3"-6" slump).

Concrete will be mixed and placed in the forms in a timely manner so that it does not begin to set prior to placement, or cold joints are not formed between successive layers. Forms shall be mortartight and unyielding as concrete is placed.

Reinforcing steel shall be placed as shown on the drawings and held securely in place while concrete is placed.

All materials used will be in good condition and meet requirements of the applicable ASTM specifications or commercial standards as shown on the drawings.

Upon completion of construction, all disturbed areas will be graded smooth and blend with the surrounding ground. Vegetation will be established by applying seeding and mulching materials as described on the drawings.

Construction operations will be carried out in such a manner that erosion and air and water pollution will be minimized and held within legal limits.